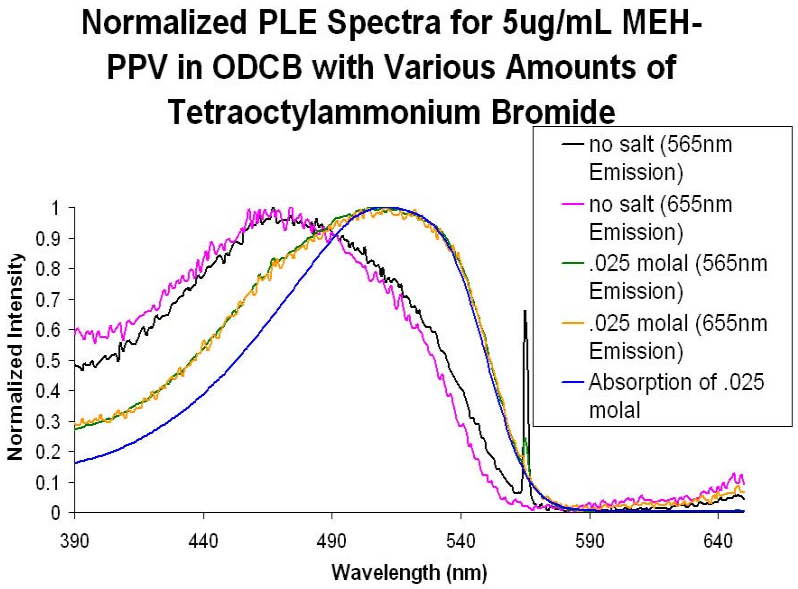
# Broader Impacts of the UCLA Phase-Modulated Fluorimeter

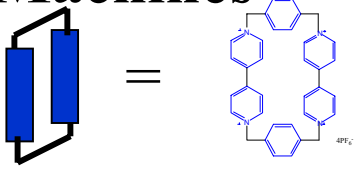
The instrument has been used by research groups in diverse areas, ranging from biochemistry, organic chemistry, physical chemistry and inorganic chemistry, to measure fluorescence and fluorescence excitation spectra as well as fluorescence lifetimes for a wide range of chemical and biological applications.

Above, UCLA Chemistry undergraduates Sean Roberts & Maud Regier work with the instrument as part of their independent research projects.

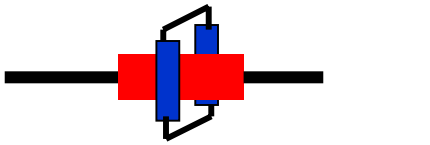
Below, fluorescence excitation data taken by Sean investigating ionic strength effects on the electronic properties of conjugated polymers was instrumental in his winning a Beckman research scholarship.



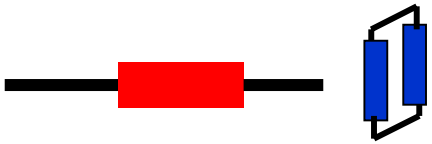
# Monitoring the Luminescence of Molecular Machines



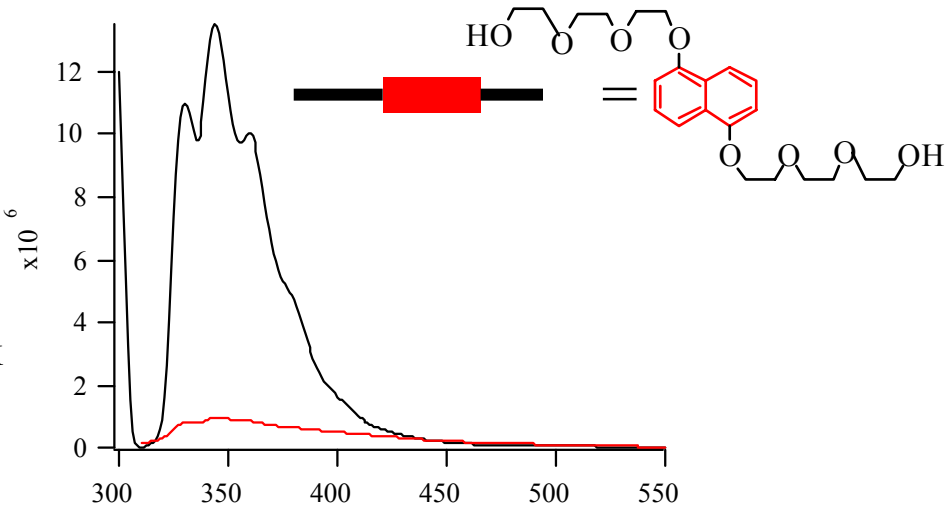
Molecular components are designed to perform mechanical-like motions in response to light energy



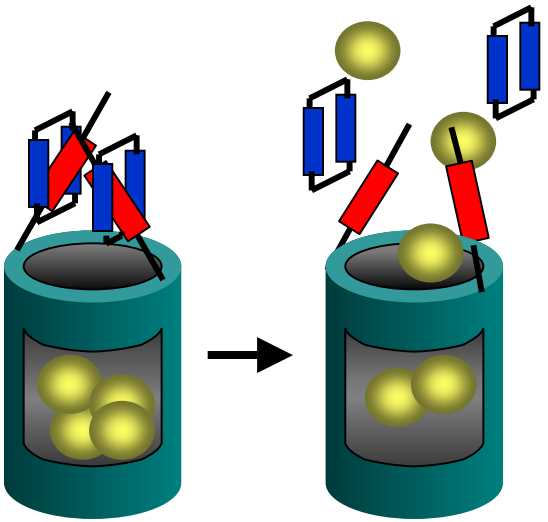
Threaded- emission of naphthalene is quenched (red trace)

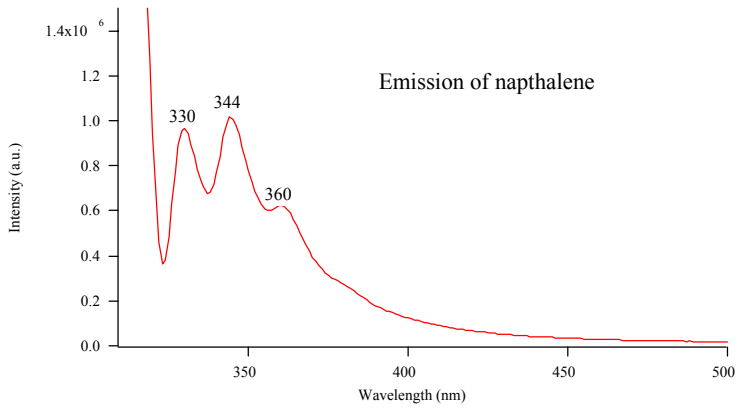


Dethreaded- emission intensity increases (black trace)

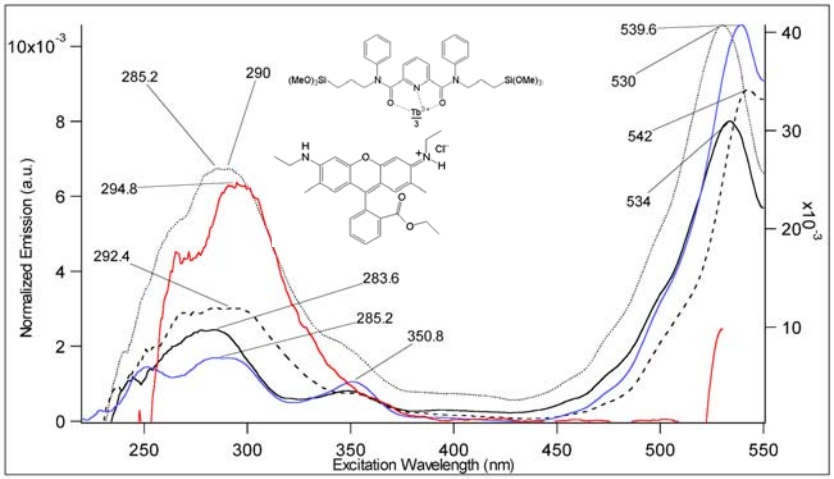


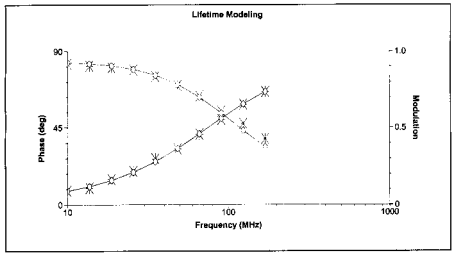

Machines function on nanostructured sol-gel materials
Pore opening is blocked and opened - a nanovalve



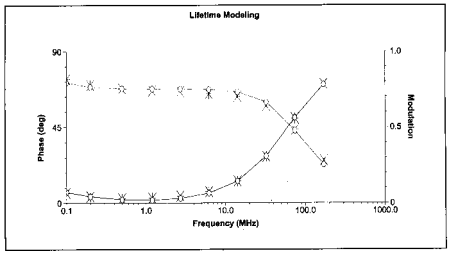


# Energy Transfer between Laser Dyes and (1) a Lanthanide and (2) a Biomolecule in Nanostructured Thin Films



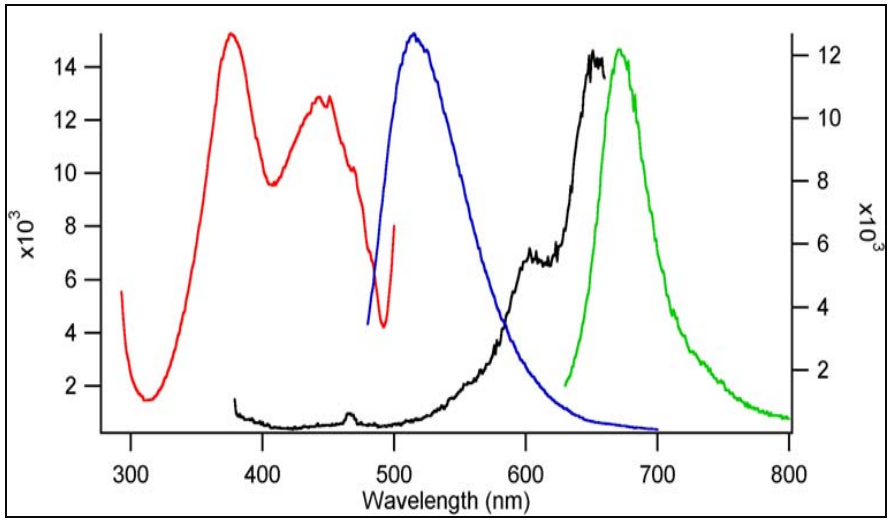




(Above) In the absence of terbium, rhodamine 6G has two life times of 2.1 ns (93%) and 126 ns (7%.)




(Above) In the presence of terbium, rhodamine 6G has two life times of 2.5 ns (74%) and 2800 ns (26%), demonstrating energy transfer.

(Left) Only in the presence of terbium does the excitation spectrum of rhodamine 6G below 350 nm (dotted trace) begins to resemble that of the terbium complex depicted (red trace) as a result of energy transfer.




Spectral overlap of flavin adenine dinucleotide (FAD) as the donor and rhodamime 700 (R700) as the acceptor

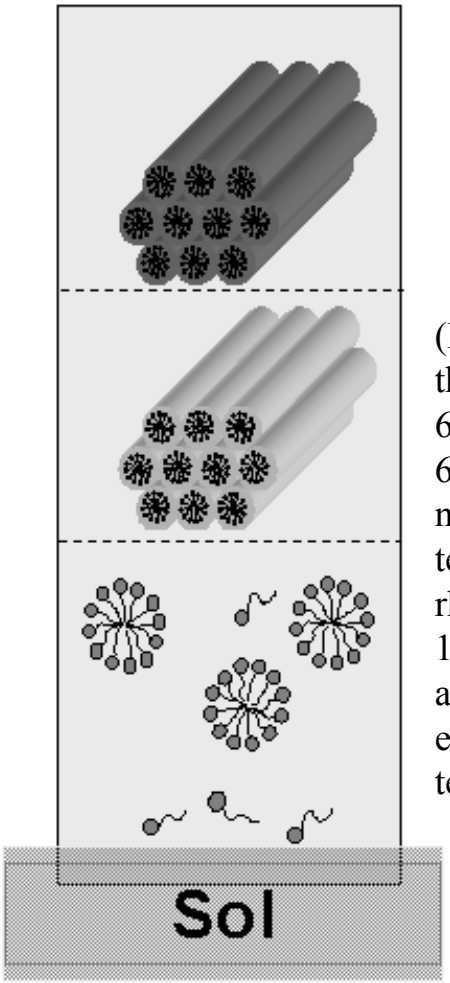
FAD excitation

FAD emission

R700 excitation

R700 emission

# Luminescence Lifetime Changes Caused by Energy Transfer in Nanostructured Thin Films




(Above) A film consisting of micelle cylinders arranged in a regular hexagonal array is rapidly formed. The spacing between adjacent cylinders is approximately 4 nm. Dopants are directed at either the silicate region (gray regions of arrays) or at the organic region (black center of arrays.)

(Right) Both pictures show the lifetime of rhodamine 6G. By itself, rhodamine 6G has a lifetime of a few nanoseconds (top.) In terbium's presence, rhodamine 6G's lifetime is 1000 times longer (bottom), a clear demonstration of energy transfer from terbium to rhodamine 6G..